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Development Solutions

ICE™-186/188 In-Circuit Emulator Installation Supplement

Order Number: 452321-003

tational Conventions

This supplement uses the following notational conventions:

`Computer output`	In the manual examples, computer output is distinguished with `monospace` type.
[...]	means the preceding item may be repeated. If a delimiter is required between entries, the delimiter appears before the ellipsis. For example, [,...] indicates a comma delimiter.
italics	indicate variable expressions. Substitute a value or a symbol.
item1::=item2	denotes that item1 is replaced by the entries designated as item2.
{items}	between braces indicate you must select one and only one of the enclosed items. Alternatives are stacked or separated by a vertical bar (e.g., item1 | item2).
[items]	between brackets indicate you may optionally select one and only one of the enclosed items. Alternatives are stacked or separated by a vertical bar (eg., item1 | item2).
<Key>	represents a named key. For example, <Enter> denotes the enter key (referred to in the syntax menu as <eol>).
punctuation	when punctuation such as periods, parentheses, braces ({}), or brackets ([]) must be entered as part of the command syntax, it will be noted in the description of the syntax in the command dictionary.
UPPERCASE	Upper-case letters represent command or parameter keywords. You can enter keywords in either upper- or lower-case letters.
`USER INPUT`	In the manual examples, user input is distinguished with `monospace` type in color.

ICE™-186/188 IN-CIRCUIT EMULATOR INSTALLATION SUPPLEMENT

Order Number: 452321-003

REV.	REVISION HISTORY	DATE
-001	Original Issue.	11/87
-002	Revised Issue. Mechanical changes to the user probe cable and enhanced human interface.	07/88
-003	Change Notice. Order number 482109-001. Changes to installation procedure.	01/89

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Appendix A

Service Information ..... Inside Back Cover

This supplement shows you how to install the ICE™-186/188 in-circuit emulator. It also shows you how to invoke the emulator software and perform the customer confidence tests.

This supplement does not provide operating or reference information for the emulator. For operating and reference information, as well as a guide through the tutorial, refer to the *ICE™-186/188 In-Circuit Emulator User's Guide.*

This supplement is organized as follows:

Chapter 1	Describes the emulator and provides unpacking instructions.
Chapter 2	Provides hardware setup and installation instructions.
Chapter 3	Provides software setup and installation instructions.
Chapter 4	Describes how to invoke the emulator software and run the customer confidence tests.
Appendix A	Describes ESD procedures.
Service Information	The inside-back cover of this supplement provides the information you need if service is required on the ICE-186/188 in-circuit emulator.

Chapter 1
Hardware Overview

1.1 Introduction

The ICE™-186/188 in-circuit emulator is designed to operate with an IBM PC AT as the host development system. This chapter presents an overview of the emulator's components, and an overview of the hardware and software installation procedures for the emulator.

1.2 Recommendations

Before unpacking the emulator, ensure that you have a safe working environment and that you have eliminated the potential for electrostatic discharge (ESD) from the area as much as possible. (ESD is a sudden electric current flowing from a charged object to another object or to ground and is potentially damaging to the bondout processor in the probe processor module.) For some procedures that may be used to minimize ESD, see Appendix A.

CAUTION

Because the emulator is test equipment, it is exempt from the requirements of Subpart J of Part 15 of the FCC rules. The emulator generates and uses radio frequency energy and may cause interference to electronic communications. Operation of the emulator outside an electronic lab area may cause interference. The FCC rules require that measures must be taken to limit such interference.

1.3 Hardware Components

The ICE-186/188 emulator includes the following components:

- Host-to-emulator communication link (RS232C cable)
- Power supply and DC and AC power cables
- Emulator controller unit (ECU)
- User probe
  - Processor module
  - Probe adapter
- Crystal power accessory (CPA)
- Software (five diskettes, 5.25 inch, 360K-byte DOS format)
- *ICE™-186/188 In-Circuit Emulator User's Guide*

The following paragraphs briefly describe these hardware components, options, and the host computer. Refer to Figure 1-1 for an overview of how these hardware pieces fit together. Detailed hardware installation instructions are provided in Chapter 2 of this supplement.

1.3.1 Host Computer

The host computer is user-supplied. You can use an IBM® PC AT or a fully equivalent computer. For a complete list of PC requirements, refer to Section 2.2 of this supplement.

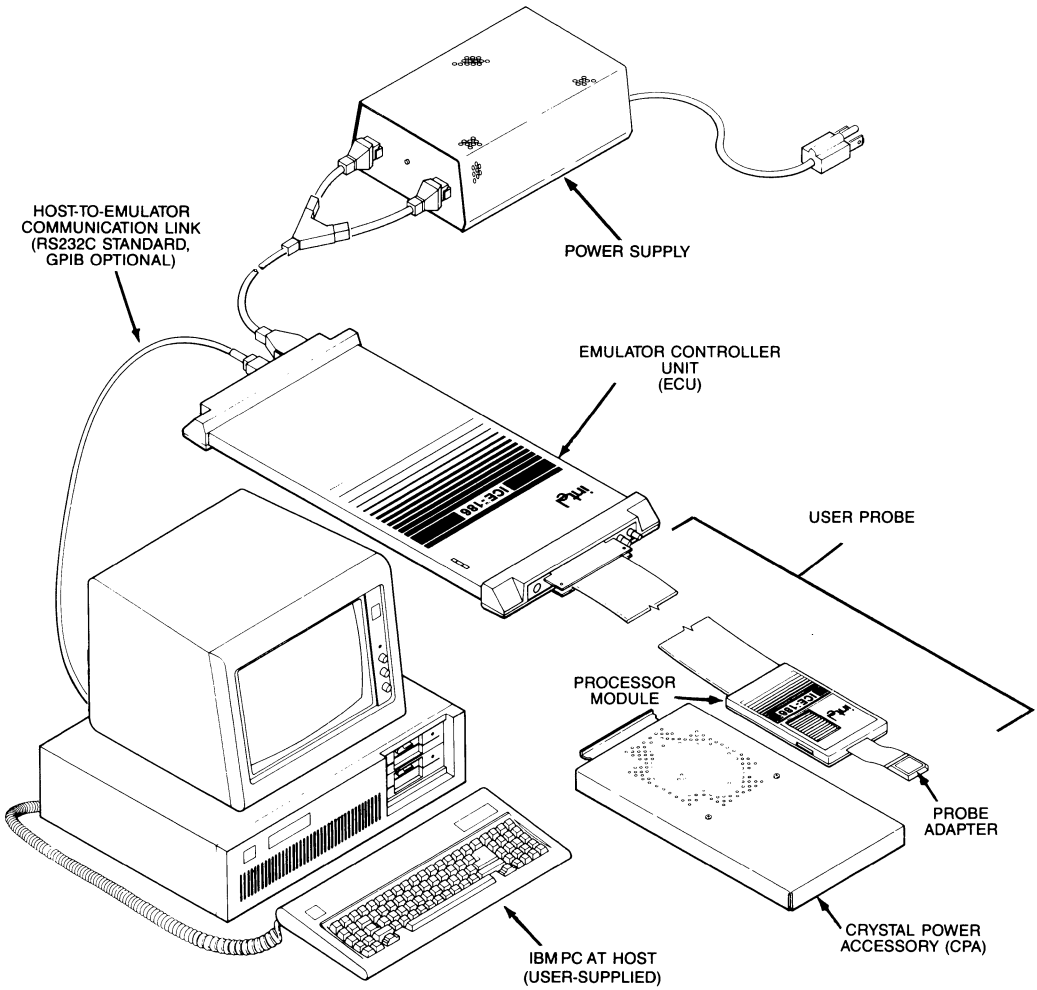


Figure 1-1 ICE™-186/188 Emulator and Host Computer

1.3.2 Host-to-Emulator Communication Link

You can use either an RS232C, or a GPIB communication link between the emulator and the IBM PC AT.

To use the RS232C communication link, your IBM PC AT must have a standard serial port (COM1 or COM2). The RS232C cable is provided with the emulator.

To use a GPIB communication link, you must install a National Instruments GPIB-PC2A^{R} board and GPIB.COM driver software (Rev C4) in your IBM PC AT. You must also supply an appropriate GPIB cable.

1.3.3 Power Supply

The power supply unit provides the voltages needed by the emulator. It meets UL and CSA standards for Information Processing Equipment and Data Processing Equipment, respectively. You can configure it for operation in most countries.

1.3.4 Emulator Controller Unit

The emulator controller unit (ECU) maintains the communication link between the emulator and the IBM PC AT and any optional external equipment. It controls all emulator functions.

1.3.5 User Probe

The user probe provides the physical connection between the emulator controller unit and the target system. It consists of a processor module, cable, and probe adapter. The processor module contains a special bondout version of the 80C186 or 80C188 microprocessor, depending on the in-circuit emulator you purchased.

1.3.6 Crystal Power Accessory

The crystal power accessory (CPA) provides the signals required by the emulator for stand-alone operation. You must use the CPA when running the customer confidence tests, as described in Section 4.4 of this supplement.

1.3.7 Optional External Equipment

The emulator can be connected to the following external equipment:

- Intel iPAT™ Analyst
- Logic Analyzer

Connector locations are provided in Section 2.6 of this supplement.

1.4 Preparing the Work Area

The site where the emulator is installed and operates must meet the following requirements:

Ambient temperature	10^{o} to 40^{o} C (50^{o} to 104^{o} F)
Ambient humidity	Maximum of 85% relative humidity, non-condensing
Electrical power	100 to 120 VAC or 200 to 240 VAC

Chapter 2
Hardware Installation

2.1 Introduction

This chapter shows you how to install the hardware components and options of the emulator.

Prior to performing the installation procedures in this chapter, turn off the emulator power supply and the target system. The proper power-up sequence is described in Chapter 4 of this supplement.

CAUTION

Damage to emulator or target circuitry can occur if the emulator or target is powered on during installation.

2.2 PC Requirements

You can use an IBM[R] PC AT or a fully equivalent computer as the host computer to the emulator. The PC must meet the following minimum requirements:

- 640K bytes of RAM in conventional memory
- An Intel Above[TM]Board with at least 1M bytes of expansion memory (See section 4.3.1 for information on incompatible expanded memory boards.)
- One 360K-byte or 1.2M-byte diskette drive
- One 20M-byte fixed-disk drive with at least 1.4M bytes of free disk space
- PC DOS 3.1 or later
- A serial port (COM1 or COM2) supporting a 9600 baud minimum data transfer rate, or a National Instruments GPIB-PC2A board. (See section 2.3.1 for information on serial link incompatibilities.)

- Proper resolution of the Above™Board, PC Link and EGA board conflict. An IBM PC/AT host system (or equivalent) configured with these three system boards will not operate correctly. With all three boards installed, there is an address conflict and the boards cannot be configured to prevent the conflict. Either replace the PC Link board with an Intel PC Link 2 board, or remove it.

Install all PC options according to the procedures supplied in their accompanying manuals. It may be necessary to re-jumper some boards in the IBM PC AT in order to install the Above Board expansion memory manager.

2.3 Connecting the Emulator to the PC

You can use either a serial (RS232C) or a parallel (GPIB) communication link between the emulator and the IBM PC AT. The connectors for the interface cables are located on the back panel of the emulator controller unit, as shown in Figure 2-1.

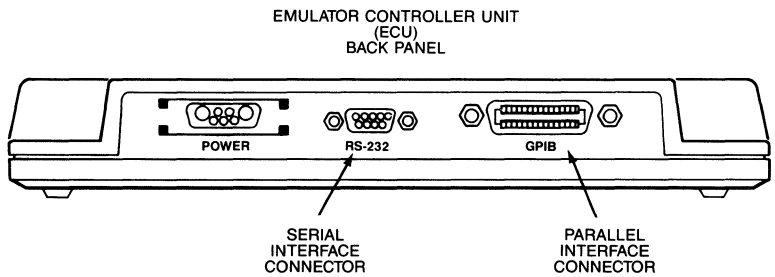


Figure 2-1 Location of the Serial and Parallel Interface Connectors

The following paragraphs describe the requirements and installation procedures for the serial and parallel communication links.

2.3.1 Using a Serial Communication Link

To use a serial communication link, you need the following:

- Serial port COM1 or COM2 in your IBM PC AT
- RS232C cable (supplied with the emulator)

The RS232C cable supplied with the emulator is compatible with standard 9-pin, D-subminiature IBM PC AT serial connectors. If you are using a third-party serial board that has a 25-pin, D-subminiature connector, you will need a 9-to-25 pin adapter for the RS232C cable. The third-party board must be functionally identical to the IBM PC AT standard serial port.

To establish a serial link between the emulator and the IBM PC AT, do the following:

1. Connect the female end of the supplied RS232C cable to the male serial connector at the back of the IBM PC AT. Use a small screwdriver to tighten the retaining screws.

NOTE

If the serial port has a 25-pin connector instead of a 9-pin connector, attach a 9-to-25 pin adapter to the RS232C cable before connecting it to the port.

2. Connect the male end of the RS232C cable to the female serial connector at the back of the emulator controller unit (ECU). Tighten the retaining screws.

Figure 2-2 indicates the 9-pin RS232C signal connections between the emulator controller unit and the IBM PC AT (host).

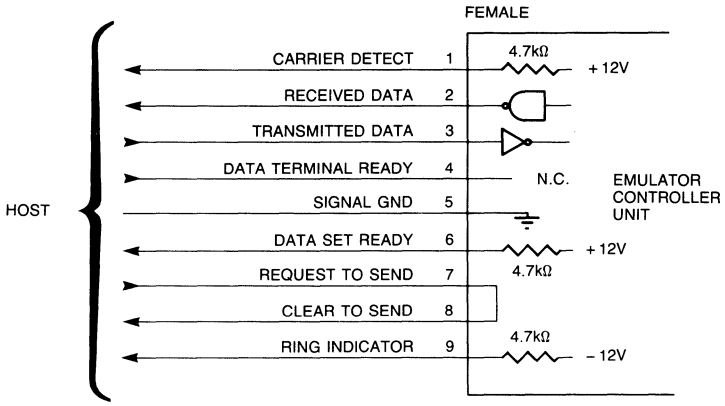


Figure 2-2 9-Pin RS232C Signal Connections

2.3.1.1 Serial Link Incompatibilities

In some cases, when the emulator is attached to an IBM PC AT host development system with an integral COM1 serial port, you may experience incorrect invocation and responses. The proper settings for serial communication are 8 data bits, no parity, and 2 stop bits. Some systems, such as an ATT6310 AT, use an independent baud rate and serial channel parameter settings.

The emulator uses DCE type serial communication. Some host computer systems, such as the ATT6310 PCAT use DTE style communications. Such computers need to use a null modem converter to change the DTE channel to a DCE one.

2.3.2 Using a Parallel Communication Link

To use a parallel communication link, you need the following:

- A National Instruments GPIB-PC2A board and GPIB.COM driver software (Rev C4).
- A GPIB interface cable that meets the requirements specified for the GPIB-PC2A board.

Install the National Instruments GPIB-PC2A board and GPIB.COM software driver according to the procedures supplied in their accompanying manuals. The device characteristics for the GPIB-PC2A board must be programmed as shown in Table 2-1 using the IBCONF.EXE setup program (see the GPIB-PC2A manual).

Table 2-1 Required GPIB-PC2A Board Settings

IBCONF Menu Selection	Setting
Primary GPIB Address of main board	0
Primary GPIB Address of device	Note 1
Secondary GPIB Address	none
Time-out Setting	T10s
EOS byte	00h
Terminate Read on EOS	no
Set EOI with EOS on write	no
Type of compare on EOS	7 bit
Set EOI with last byte of write	yes
GPIB-PC Model	PC2A
GPIB-PC is system controller	yes
Local lockout on all devices	yes
Disable Auto Serial polling	no
High-speed timing	yes
Interrupt jumper setting	Note 2
Base I/O address	Note 2
DMA Channel	Note 2

(Notes 1 and 2 are on following page)

Note 1: The Primary GPIB Address of the device should be set to match the value set on the emulator GPIB address switch (see Figure 2-3). The switch is labeled for settings of 0 through F (0 through 15 decimal). Although the IBCONF.EXE program allows settings of 0 through 30, you must select an address in the 1 through 15 range. Do not select address 0, since this address is already in use as the Primary GPIB Address of the GPIB-PC2A board. If you change the switch setting, you must cycle the emulator power.

Note 2: The Interrupt Jumper, Base I/O Address, and DMA Channel settings are dependent on your IBM PC AT configuration. All other settings must be programmed as indicated above.

To establish a parallel link between the emulator and the IBM PC AT, do the following:

1. Connect one end of the GPIB interface cable to the GPIB connector at the back of the IBM PC AT. Use a small screwdriver to tighten the retaining screws.
2. Connect the other end of the GPIB interface cable to the GPIB connector at the back of the emulator controller unit (ECU). Tighten the retaining screws.
3. Remove the protective metal cap at the left front of the ECU and locate the GPIB address switch (see Figure 2-3).

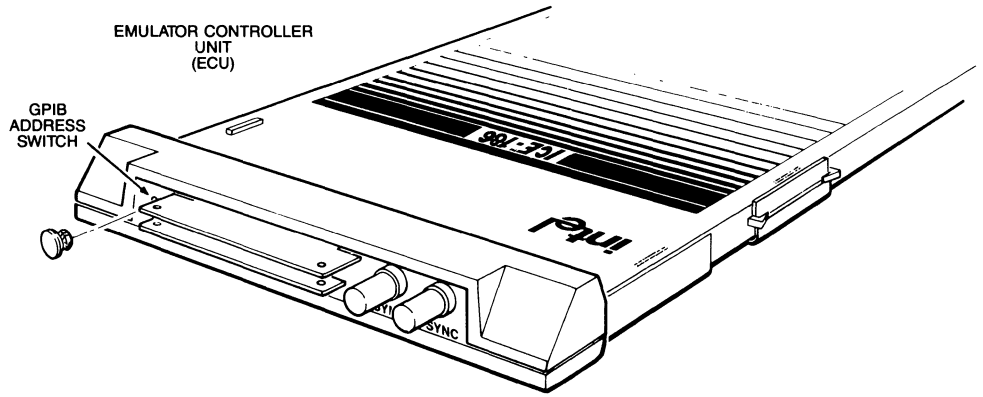


Figure 2-3 Location of the GPIB Address Switch

4. Using a small screwdriver, set the address switch to the same Primary GPIB Address you assigned to the emulator device on the Device Characteristics screen when you ran the GPIB-PC2A IBCONF.EXE setup program (see "Note 1" in Table 2-1).

   If you need to find this address, run the IBCONF.EXE setup program and:

   a. Select the emulator device name on the Device Map.

   b. Select Edit (F8) from the IBCONF menu.

   c. Note the value of the Primary GPIB Address shown in the Device Characteristics display for the emulator device name.

   Refer to the GPIB-PC2A manual for instructions on how to run the IBCONF.EXE setup program.

5. Re-install the protective metal cap at the front of the ECU.

2.4 Installing the Power Supply

Figure 2-4 illustrates how to install the emulator power supply. Refer to this figure while reading the following instructions:

1. Turn the power supply off.
2. Set the power supply in the desired location.

CAUTION

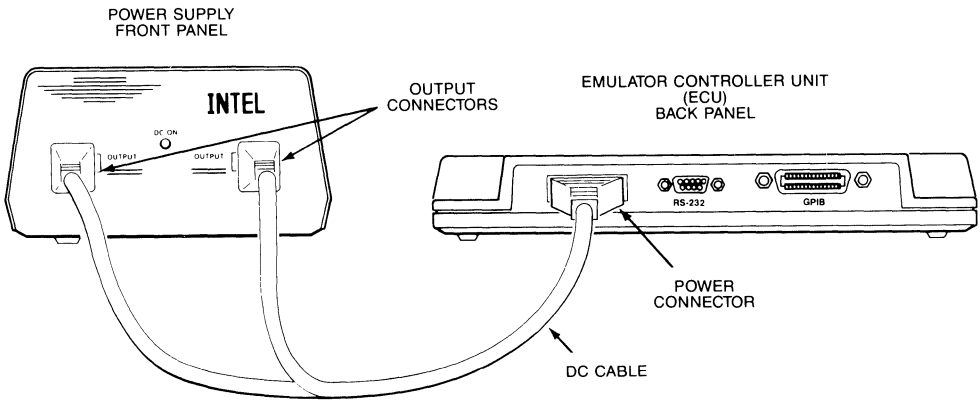
Provide at least 15 cm (6 inches) of clearance around cooling holes to ensure proper cooling.

3. Locate the VOLT SELECT switch on the power supply back panel. Set the switch to the value appropriate for your area: 115 for 100-120 VAC operation or 230 for 200-240 VAC operation. Use a small screwdriver as a lever to change the line voltage switch setting.

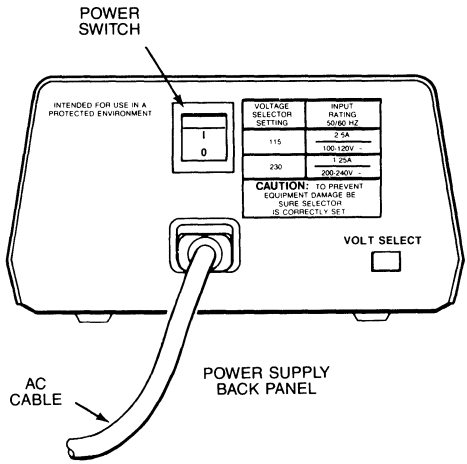
CAUTION

To prevent damage to the equipment, ensure that the VOLT SELECT switch on the power supply is set to the value appropriate for your area.

4. Connect the two plugs on the DC power cable to the two OUTPUT connectors on the front panel of the power supply. (It does not matter which plug goes into which OUTPUT connector.) Be sure that the latches on each side of each plug are fully engaged.
5. Connect the D-type connector on the DC cable to the mating connector on the back of the ECU. Secure the connection with the connector slide lock.



DC CABLE CONNECTION



AC CABLE CONNECTION

Figure 2-4 Installing the Power Supply

6. Connect the socket end of the AC power cord to the receptacle on the back panel of the power supply.

7. Do not plug the AC power cord into your power outlet until you have completed the installation procedures and connected the user probe to a target system. Proper power-up procedures are described in Chapter 4 of this supplement.

2.5 Installing the User Probe

This section shows you how to install the user probe. It assumes that both the emulator and the target system are turned off and disconnected from any power source.

Figure 2-5 illustrates the user probe assembly. The ECU pod connectors attach to the emulator controller unit (ECU), and the probe adapter inserts into the target socket.

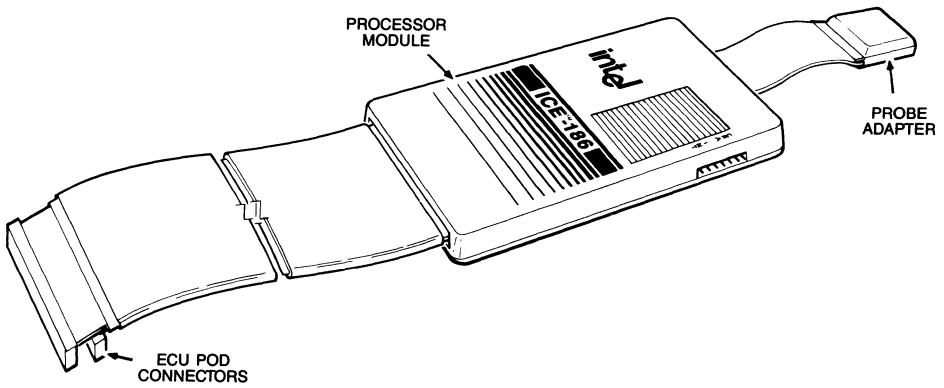


Figure 2-5 The User Probe

CAUTION

Damage to user probe or target circuitry can occur if the emulator or target is powered on when the probe adapter is inserted or removed from the target socket.

CAUTION

The processor module is susceptible to damage due to electrostatic discharge (ESD). The probe adapter is shipped with anti-static foam and should be plugged into this foam whenever it is not plugged into the target. Follow proper ESD handling procedures as described in Appendix A during installation of the user probe.

2.5.1 Connecting the User Probe to the ECU

Before you can connect the user probe to the emulator controller unit, the front panel of the ECU has to be removed, as illustrated in Figure 2-6.

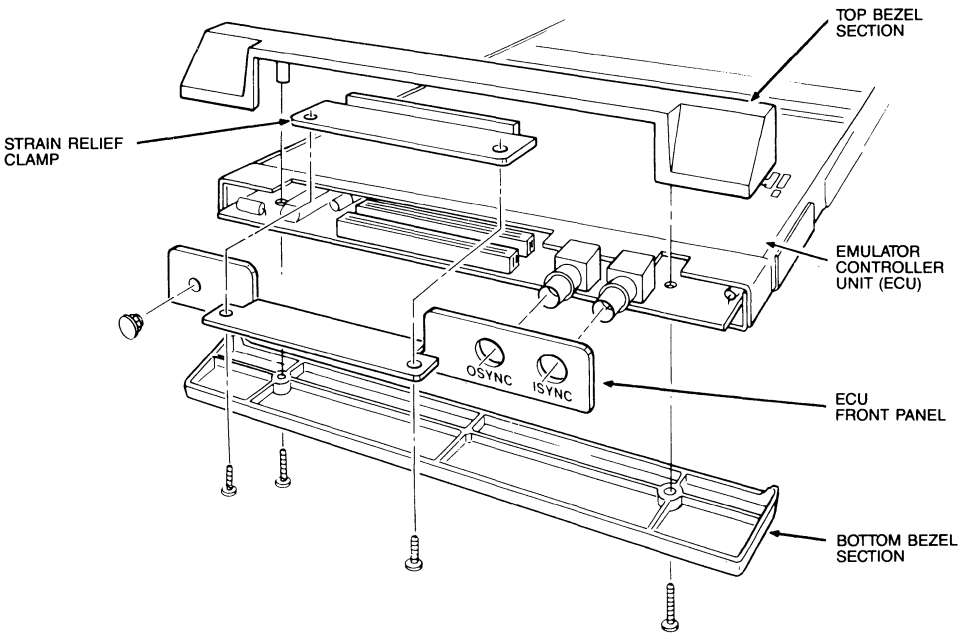


Figure 2-6 Removing the ECU Front Panel

Remove the ECU front panel by performing the following steps:

1. Loosen and remove the two Phillips screws from the bottom front bezel of the ECU.
2. Remove the top and bottom front bezel sections and set them aside.
3. Pull the front panel straight away from the ECU and set it aside.

Now connect the probe ECU pod connectors to the ECU as shown in Figure 2-7. The bottom pod connector attaches to the front cable connector of the ECU, and the top pod connector attaches to the back cable connector of the ECU. Make sure that the pod connectors are fully seated.

Once the pod connectors are attached to the ECU, re-install the ECU front panel and bezel sections. The cables pass through the notch provided in the top edge of the front panel.

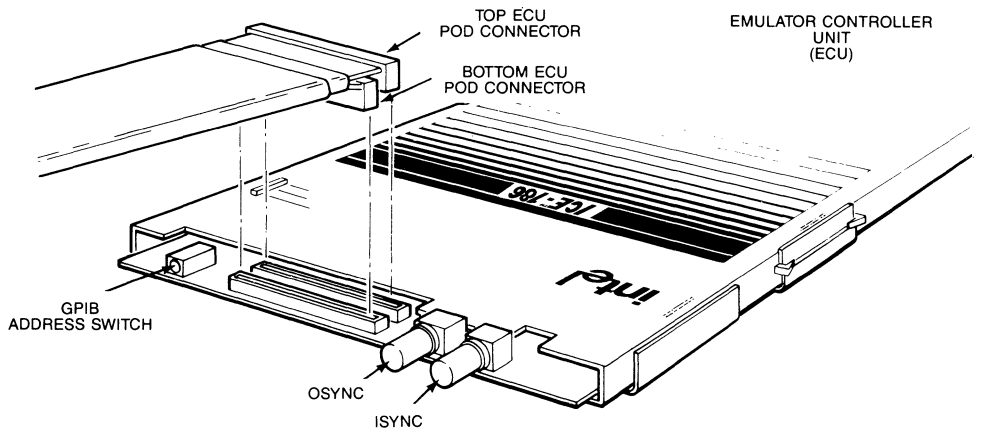


Figure 2-7 Connecting the Probe Pod Connectors to the ECU

2.5.2 Connecting the User Probe to the CPA

You can connect the user probe to a target system or to the crystal power accessory (CPA). The CPA allows the emulator to operate in a stand-alone mode, in which case the CPA serves as the target. The CPA must be used when running SELFTEST (see Section 4.4 in this supplement).

For prototype systems that support a surface-mounted PLCC package of the 80C186 or 80C188, the emulator provides the capability for emulation. By using a customized socket adapter, the emulator mode adapter will fit over the surface-mounted PLCC 80C186 or 80C188 chip and will emulate the component when the 80C186 or 80C188 is reset. Contact your local Intel sales office for ordering information.

NOTE

Intel recommends using the PLCC sockets made by AMP^{R} manufacturing. These sockets have guiding ridges that provide direction for the PLCC cable pins in the emulator flex cables and prevent any shorting out.

Figure 2-8 illustrates the installation of the CPA. Refer to this figure while reading the following instructions:

1. Use a Phillips screwdriver to remove the four screws from the top cover of the CPA. Then lift the top cover up and set it aside.

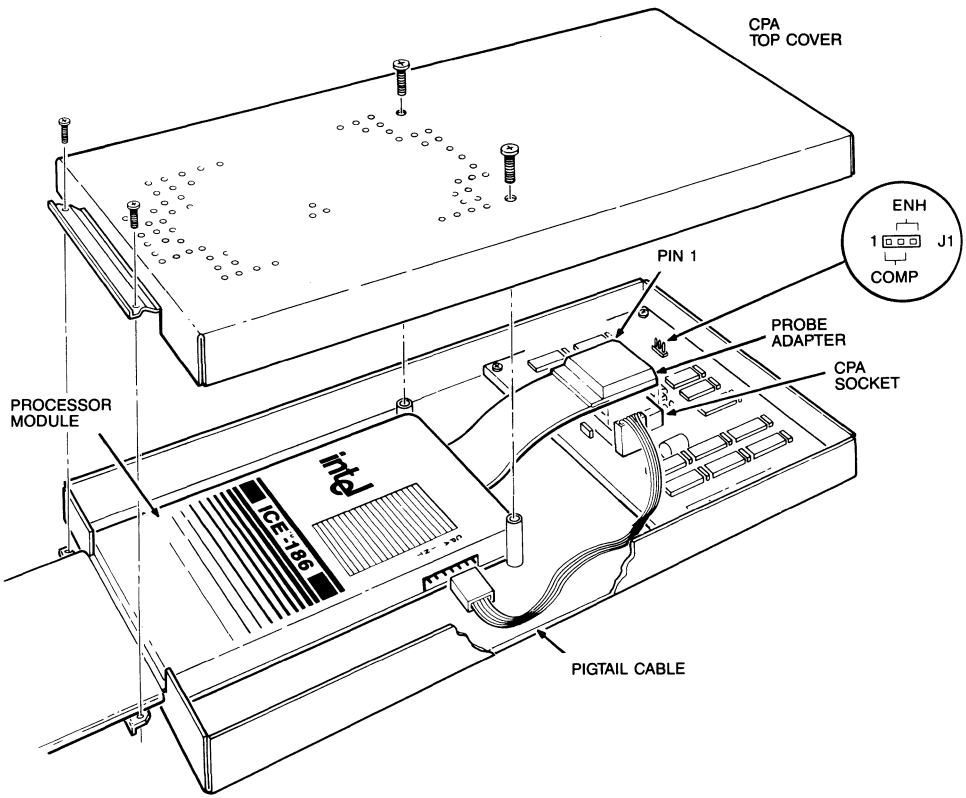


Figure 2-8 Crystal Power Accessory (CPA) Installation

2. Position jumper J1 for the desired 80C186 or 80C188 operation mode. You can select either Compatible or Enhanced mode operation by placing the jumper over the pins labeled "COMP" or "ENH", respectively.

   Refer to the *Intel 80C186 CHMOS High Integration 16-Bit Microprocessor* data sheet, order number 270354, or the *Intel 80C188 CHMOS High Integration 8-Bit Microprocessor* data sheet, order number 270432, for more information on Compatible and Enhanced mode operation.

3. Connect the pigtail cable from the CPA circuit board to the four CPA pins on the side of the probe processor module. (The orientation of the cable does not matter.) This pigtail cable supplies power to the CPA when the emulator is powered up.

4. Lay the processor module in the CPA enclosure. Position the module so that the exposed copper section of the module cable is nested in the notch of the enclosure.

5. Locate pin 1 on the probe adapter. Pin 1 is identified on the adapter label and by the beveled corner on the adapter.

6. Align pin 1 on the adapter with pin 1 on the CPA socket (refer to Figure 2-8 for orientation).

7. Insert the adapter into the CPA socket. Apply even pressure to seat the adapter properly. Do not force the connection.

CAUTION

Do not force the probe adapter into the CPA socket. If the adapter does not insert into the CPA socket smoothly, check your pin 1 orientation. Incorrect orientation can damage the user probe and CPA.

8. Re-install the top cover of the CPA.

When disengaging the probe adapter from the CPA socket, grasp the CPA enclosure and the adapter firmly, then pull the adapter straight up and away from the socket. Avoid wedging the adapter out of the socket.

2.5.3 Connecting the User Probe to the Prototype

To connect the user probe to a prototype system, do the following:

1. Locate pin 1 on the probe adapter. Pin 1 is identified on the adapter label and by the beveled corner on the adapter.
2. Align pin 1 on the adapter with pin 1 on the prototype socket.
3. Insert the adapter into the socket. Apply even pressure to seat the adapter properly. Do not force the connection.

CAUTION

Do not force the probe adapter into the prototype socket. If the adapter does not insert into the socket smoothly, check your pin 1 orientation. Incorrect orientation can damage the user probe and the prototype.

When inserting the probe adapter into the prototype socket, do not pull or crease the flex circuit cable on the adapter. Excessive pulling or creasing can damage the flex circuit cable. Also, position the processor module so as to achieve maximum air flow over the finned heat sink.

Intel offers an adaptor to support target systems that use a surface-mounted PLCC-package type 80C186 or 80C188 microcontroller. Using the adaptor, the emulator can be connected to the target without having to remove the microcontroller. This operation is called the ONCE™ mode of in-circuit emulation. For ordering information call your local Intel sales office.

2.5.4 The Multibus® II System

If you are using the Multibus® II system as your prototype system, note that the Multibus II system is based on the 8751 microcontroller chip, which performs a system interrogation to determine what boards are present and to ensure they are operative. This interrogation occurs within approximately 15 seconds after the system is powered on. In order to ensure the Multibus II system functions with the emulator, you must enter the following startup code. This code is dependent upon the iSBC® board being used.

NOTE

The emulator user cable can be inserted into the Multibus® II system board with power off any time during the creation of the PROC. Apply power to the Multibus® II target system. You must invoke the PROC STARTUP as soon as the Central Services Module (CSM) Board's yellow Built-In-System-Test (BIST) LED goes out. Do this by entering STARTUP <Enter>. Note that the user only has 5 to 10 seconds to run this PROC after the BIST LED goes out. Otherwise, the Multibus® II board will time out and power must be removed to reset the system.

2.6 Using Optional External Equipment

The emulator can be connected to the following external equipment:

- Intel iPAT Analyst
- Logic Analyzer

Connectors for the external equipment are provided on the side panel of the emulator controller unit (ECU), as shown in Figure 2-9. To access these connectors, remove their ESD protective shields. The shields are held in place with Phillips screws on the bottom of the ECU.

Keep the ESD protective shields in place whenever the connectors are not being used.

For information on installing iPAT, see Section 4.4.2.

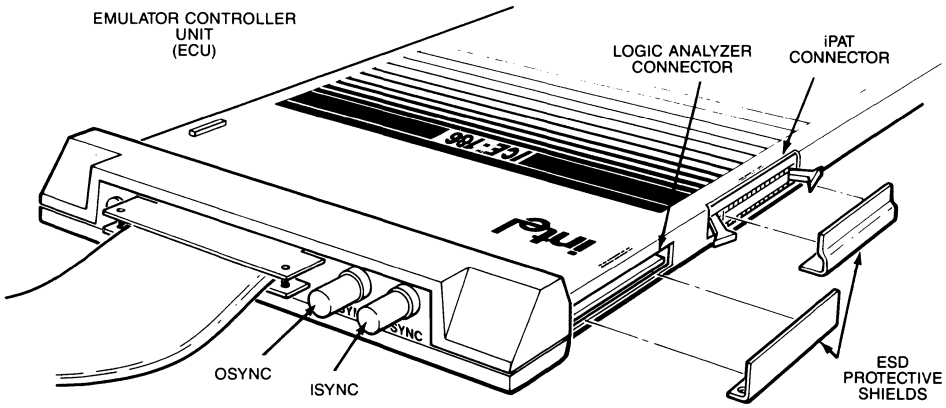


Figure 2-9 External Equipment Connectors

For a description of the logic analyzer connector pinouts and signal timing relationships, refer to Chapter 5 of the *ICE™-186/188 In-Circuit Emulator User's Guide.* As you view the logic analyzer connector in its opening in the ECU housing, pin 1 is the lower left pin, pin 2 is the upper left pin, pin 59 is the lower right pin, and pin 60 is the upper right pin.

2.6.1 Attaching the iPAT™ Analyst

Locate the cable attachment shipped with your emulator and attach the DIN connector to the emulator control unit (ECU) iPAT connector and the other end of the cable to the iPAT analyst (which should be sitting next to the control unit) according to the instructions in its installation section. Do not twist the cable.

For a description of the logic analyzer connector pinouts and signal timing relationships, refer to Chapter 5 of the *ICE™-186/188 In-Circuit Emulator User's Guide*. As you view the logic analyzer connector in its opening in the ECU housing, pin 1 is the lower left pin, pin 2 is the upper left pin, pin 59 is the lower right pin, and pin 60 is the upper right pin.

2.6.1 Attaching the iPAT™ Analyst

Locate the cable attachment shipped with your emulator and attach the DIN connector to the emulator control unit (ECU) iPAT connector and the other end of the cable to the iPAT analyst (which should be sitting next to the control unit) according to the instructions in its installation section. Do not twist the cable.

If it appears as though you must twist the cable, you may be using the cable attachment designed for I²ICE systems. Although the cable attachment from the emulator to the iPAT analyst is not functionally different from that of the I²ICE development system to the iPAT analyst, the cables are merged differently at the ECU connection; the DIN connector is inverted for an easy connection to the ECU. (The iPAT analyst is designed to sit on top of the I²ICE system and to sit beside the emulator.)

WARNING

Do not use an I²ICE cable to connect the iPAT analyst to the emulator controller unit. If you have to twist the cable attachment to make the connection, call your local Intel sales representative and order the iPATCABLE. (This product should have been included with the emulator.)

2.6.2 Using One or Two Hosts

Since the emulator works with the stand-alone iPAT unit, the emulator must be emulating while the iPAT analyst is being used. If you have two host development systems, you can operate the emulator and the analyst at the same time. Attach the emulator to one development system and the analyst to the other. Connect the analyst

to the emulator, then invoke the emulator software, load the program and begin emulation. You can invoke the iPAT analyst without having to exit the emulation software.

To operate the iPAT analyst with one host, invoke the emulator software, load the program to be executed, begin emulation, and exit the emulator without halting emulation. Then you can invoke the iPAT software and analyze the execution. To return to the emulator, exit the iPAT analyst, then invoke the emulator using: RERUN186.

2.6.3 Hardware Interrupt Input for the iPAT™ Analyst

One of the features of the iPAT analyst is that it can be used to measure hardware-interrupt-to-software-event latency time. When using the emulator to generate the hardware interrupt, you have two choices. You can use one of the four processor INT lines or an external input. To select one of the INT lines or the external input, use the IPATINT command (see the *ICE™-186/188 In-Circuit Emulator User's Guide*). The emulator outputs tag words to the iPAT analyst to indicate the occurrence of an interrupt event. An interrupt event occurs when there is a low-to-high transition on the selected input.

To measure the latency from the external interrupt source, you must construct a pigtail cable that meets the specifications shown in Figure 2-10, then connect the cable between the external source and the INT side pins on the probe processor module.

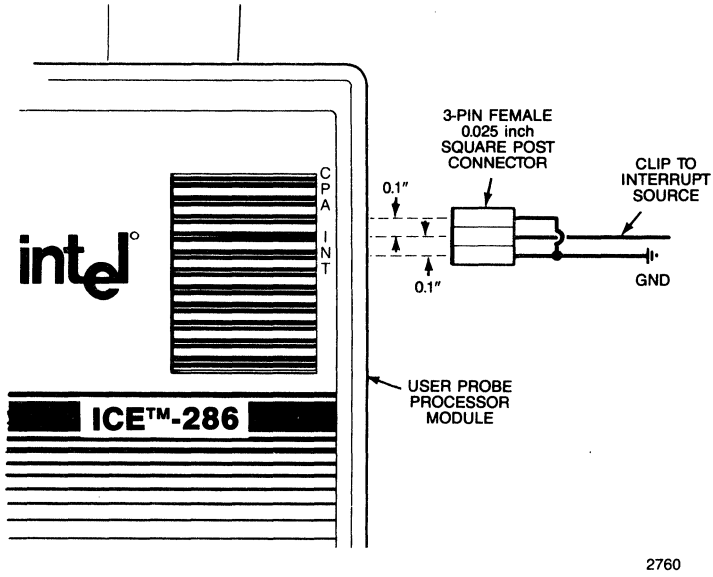


Figure 2-10 Pigtail Cable for an External Hardware Interrupt

Chapter 3
Software Installation

3.1 Introduction

This chapter shows you how to install the emulator software and edit its configuration files. Invocation of the software is described next, in Chapter 4 of this supplement.

Before installing the emulator software, create back-up copies of the software diskettes. To do this, use the DOS DISKCOPY command. Store the original diskettes in a safe place and use the back-up copies during the installation process.

The installation process is composed of three steps:

1. Modifying the DOS CONFIG.SYS and AUTOEXEC.BAT files.
2. Installing the emulator software onto the fixed disk.
3. Invoke SETUP to specify many options including screen colors and the correct host-to-emulator communication link (serial or GPIB).

These steps are described in detail in the following sections.

3.2 Modifying CONFIG.SYS and AUTOEXEC.BAT

Before installing the emulator software, you need to set up the following DOS parameters:

- Modify the DOS CONFIG.SYS file to support the correct number of files and buffers and device drivers.
- Modify the DOS AUTOEXEC.BAT file to include the PATH command, with "ICE186" as one of the path directories.

3.2.1 Modifying CONFIG.SYS

To modify the CONFIG.SYS file, do the following:

1. Turn on the IBM^{R} PC AT and wait for it to finish its boot procedures.
2. After the DOS prompt is displayed, switch to the root directory on the fixed disk:

```
C> CD\
```

3. Verify that a CONFIG.SYS file is present in the root directory by using the DIR command:

```
C> DIR C:\CONFIG.SYS
```

   If a CONFIG.SYS file is not present, create one. (Refer to your DOS manual for instructions.)

4. Using a text editor, ensure that the CONFIG.SYS file contains the following minimum entries:

```
files=40
buffers=15
device=ansi.sys
device=emm.sys (options)
break=on
```

NOTE

If you are installing the most recent version of Intel's LIM 4.0 software to support your Intel Above^{TM}Board's expanded memory, the entry "device=emm.sys" will not work; it must use the options described in the LIM 4.0 software package. Enter the appropriate Above Board expansion memory options following the line "device=emm.sys". One megabyte of expansion memory is required.

If you intend to use the GPIB communication option, enter the following additional device driver:

```
device=GPIB.COM
```

If you intend to use the RS232C communication option, remove any other devices assigned to the PC port (COM1 or COM2) being used by the emulator. Another device assigned to the same PC port being used by the emulator will interfere with host-to-emulator communications.

3.2.2 Modifying AUTOEXEC.BAT

The installation program provided with the emulator software creates a directory named ICE186 and copies all emulator software files into this directory. By placing the directory pathname in a PATH string in your AUTOEXEC.BAT file, you are able to access the emulator software files from any directory on your fixed disk. Otherwise, you can access those files only from the ICE186 directory.

To add a PATH string to the AUTOEXEC.BAT file, do the following:

1. Enter the root directory:

```
C> CD\
```

2. Verify that an AUTOEXEC.BAT file is present in the root directory by using the DIR command:

```
C> DIR C:\AUTOEXEC.BAT
```

   If an AUTOEXEC.BAT file is not present, create one. (Refer to your DOS manual for instructions.)

3. Using a text editor, add or modify the PATH command to the file and make one of its directory pathnames "*d*:\ICE186", where *d* is the drive specification of the fixed disk on which the ICE-186 software is being installed. Assuming you copy the ICE-186 files to drive C, enter the following command in your AUTOEXEC.BAT file:

```
PATH=C:\ICE186
```

   DOS will search the directories in the order they are entered in the command string. (For more information, refer to your DOS manual.)

4. After modifying CONFIG.SYS and AUTOEXEC.BAT, reboot your IBM PC AT to put the changes into effect. You may

receive the message "Out of environment space" during rebooting. If so, you have the following two options:

- Delete any unnecessary SET commands in the AUTOEXEC.BAT file, as well as any unnecessary directories in PATH.
- Increase environment space by adding a SHELL command specification in the AUTOEXEC.BAT file. (Refer to your DOS manual for instructions.)

NOTE

Do not change any of the pre-defined TERMCAP characters. If the TERMCAP characters are changed by other user installed programs, the emulator software may fail upon invocation. A typical error message is:

```
Error, terminal capability CE not found for terminal type IBM PC.
```

To fix the problem, re-install the emulator software or edit the TERMCAP file to restore the pre-defined characters.

3.3 Installing the ICE™-186/188 Software

After you have modified the CONFIG.SYS and AUTOEXEC.BAT files, you can install the emulator software. Distribution diskette number 1 of 5 contains a program that automates software installation for the emulator. To run this program, do the following:

1. Enter the root directory:

   ```
   C> CD\
   ```

2. Insert diskette number 1 of 6 into a 5 1/4" floppy disk drive. If your source disk drive is A, and your destination fixed disk is C, type:

   ```
   C> A:INSTALL A: C:
   ```

   A colon must be included in the drive specification.

The installation program creates a directory named ICE186 on the destination drive and copies the ICE-186 software into it. Messages

will appear asking you to insert the various diskettes when appropriate; respond accordingly. When the installation process is complete, the DOS prompt (C>) reappears on the screen.

Note that 1.4M bytes of free disk space are required for installation of the emulator software. If you receive an error message indicating that there is not enough disk space, correct the problem and re-execute the INSTALL program.

3.4 Invoking SETUP

Once the emulator software has been installed, invoke SETUP to modify the emulator configuration files to support the correct host-to-emulator communication link and to specify the default queue status mode.

The emulator uses three configuration files during operation. These files are:

- I186.CFG - operating environment configuration file
- ICE186.CFG - emulator environment configuration file
- V186.CFG - communication configuration file

By default, the configuration files establish serial communication at 38400 baud via COM1. If you are using a different communication link and baud rate, invoke SETUP to change the configuration files appropriately.

For additional information about the configuration files, refer to Chapter 3 of the *ICE™-186/188 In-Circuit Emulator User's Guide.*

3.5 Specifying the Queue Status Mode

The V186.CFG file contains a variable named QSTAT. This variable specifies whether the emulator defaults to queue status mode or normal mode on power up. The mode setting determines the signal definitions of processor pins 61, 62, and 63.

If you specify QSTAT=0, the emulator defaults to normal mode and the processor pin definitions are:

Pin 61 = ALE
Pin 62 = /RD
Pin 63 = /WR

If you specify QSTAT=1, the emulator defaults to queue status mod and the processor pin definitions are:

Pin 61 = QS0
Pin 62 = /QSMD
Pin 63 = QS1

The QSTAT variable is optional and can be deleted from the V186.CFG file. If the variable is deleted, the emulator software automatically prompts you for a QSTAT setting (0 or 1) at invocatio time.

You can override the default QSTAT setting by using the QSTAT to variable once the emulator software has been invoked. For more information about this tool variable, refer to the *ICE™-186/188 In-Circuit Emulator User's Guide.*

3.4.3 Specifying the Queue Status Mode

The V186.CFG file contains a variable named QSTAT. This variable specifies whether the emulator defaults to queue status mode or normal mode on power up. The mode setting determines the signal definitions of processor pins 61, 62, and 63.

If you specify QSTAT=0, the emulator defaults to normal mode and the processor pin definitions are:

Pin 61 = ALE
Pin 62 = /RD
Pin 63 = /WR

If you specify QSTAT=1, the emulator defaults to queue status mode and the processor pin definitions are:

Pin 61 = QS0
Pin 62 = /QSMD
Pin 63 = QS1

The QSTAT variable is optional and can be deleted from the V186.CFG file. If the variable is deleted, the emulator software automatically prompts you for a QSTAT setting (0 or 1) at invocation time.

You can override the default QSTAT setting by using the QSTAT tool variable once the emulator software has been invoked. For more information about this tool variable, refer to the *ICE™-186/188 In-Circuit Emulator User's Guide.*

Chapter 4
Confirming Proper Operation

4.1 Introduction

This chapter shows you how to power-up the emulator, invoke the software, and run the customer confidence tests.

It is assumed that you have already installed the emulator hardware and software, and have connected the user probe to the crystal power accessory (CPA). If not, refer back to Chapters 2 and 3 of this supplement and perform the installation procedures before proceeding.

CAUTION

Damage to equipment may occur if you install the emulator and user probe while the emulator or the target is powered on.

The power-up and invocation procedures described below also apply when you've connected the user probe to a prototype system. However, the customer confidence tests can be performed only when the user probe is connected to the CPA.

4.2 Powering Up the Emulator

To power-up the emulator, do the following:

1. Plug in the IBM PC AT and the emulator power supply.
2. Turn on the IBM PC AT.
3. Turn on the emulator power supply. The power switch is located on the power supply back panel.

NOTE

If you have connected the user probe to a prototype system, power-up the prototype at this time.

4.2.1 Power-ON LED Sequence

There are three LED indicator lights on the emulator controller unit. These LEDs indicate the following:

- Red LED - indicates that power is on.
- Green LED - indicates that the communication link between the emulator and the IBM PC AT is being exercised.
- Yellow LED - indicates when the emulator is emulating (Run mode).

At power-up, the red LED turns on and remains on as long as the emulator is receiving power. The green LED turns on briefly, then turns off. The yellow LED remains off at power-up.

If the green LED does not turn on at power-up, or if it turns on and remains on, the emulator has detected a hardware error and cannot power-up successfully. In this case, contact your nearest Intel service representative for assistance. Service information is provided on the inside-back cover of this supplement.

4.3 Invoking the ICE™-186/188 Software

Once the power-up sequence completes successfully, you can invoke the emulator software by running the batch file named RUN186.BAT. You can execute this batch file from any directory as long as you have modified the DOS PATH as indicated in Section 3.2.2. If you have not modified the PATH, you must enter the ICE186 directory, then execute the batch file.

To execute the batch file, enter "RUN186" after the DOS prompt.

For example:

```
C> RUN186
```

The batch file automatically reads the I/O device information from the configuration files and activates the emulator. It also downloads the emulator control unit and user probe software.

During execution, the batch file displays the status of the invocation process on the screen. When the invocation process is complete, the command-line prompt changes to "hlt>". This prompt indicates that the emulator has been activated and is in Halt mode. You are now ready to run the customer confidence tests.

4.3.1 Invocation Errors

Following is a list of invocation error types that can occur if you install the emulator hardware and/or software incorrectly. Below each error type is an explanation and a recommended action.

Note that if an error message is followed by [*], you can obtain additional information about the error by using the HELP command. For a detailed description of the HELP command, refer to the *ICE™-186/188 In-Circuit Emulator User's Guide.*

- **Above Board error**

  An error message is displayed if the emulator software cannot find an Above Board or enough expansion memory.

  Recommended Action: Install an Above Board in your IBM PC AT using the procedures provided in the Above Board manual. The emulator requires an Above Board with at least 1M byte of expansion memory. It may be necessary to re-jumper some boards in the IBM PC AT in order to install the Above Board expansion memory manager.

  Once the Above Board is installed, re-execute the RUN186.BAT file.

- **Incompatible Expanded Memory Boards**

  Some expanded memory boards are incompatible with the emulator software. If an incompatible board is installed in an IBM PC AT host development system, any of the following errors may be displayed:

```
Error 218T, Serial UART communications failure.
Error 419T, load failed on I/O device.
Error OVL, can't get page map.
```

If the expanded memory board does not adhere exactly to the hardware and software requirements described in the Lotus/Intel/Microsoft (LIM) specifications, version 3.2 or greater, the emulator software cannot function properly in the required expanded memory.

Recommended Action: Try to install and run the emulator software using a third party Above Board. Should the invocation fail with error messages previously described, obtain a genuine Intel Above™Board with the required EMM.SYS driver.

- **PC memory allocation error**

  An error message is displayed if there is not enough conventional PC memory to load the emulator software.

  Recommended Action: Remove any memory-resident PC programs, then execute the RUN186.BAT file. To load properly, the emulator software requires at least 440K bytes of RAM in conventional PC memory.

- **Activation error**

  An error message is displayed if the IBM PC AT cannot establish communication with the emulator controller unit.

  Recommended Action if Using the RS232C Interface: Exit the emulator software using the EXIT command, then make the following checks to attempt to identify the error source:

  1. Verify that the emulator is on.
  2. Verify that the RS232C cable is connected properly (see Section 2.3.1).
  3. Verify that the I/O device variables are set up correctly in the ICE186.CFG and V186.CFG files (see Section 3.4.1).

     Re-execute the RUN186.BAT file. If the error persists, exit the emulator software and modify the V186.CFG file to support a lower baud rate (see Section 3.4.1).

  Recommended Action if Using the GPIB Interface: Exit the emulator software using the EXIT command, then make the following checks to attempt to identify the error source:

  1. Verify that the emulator is on.
  2. Verify that the GPIB cable is connected properly (see Section 2.3.2).

3. Verify that the device characteristics for the GPIB-PC2A board are correct (see Section 2.3.2).

4. Verify that the I/O device variables are set up correctly in the ICE186.CFG and V186.CFG files (see Section 3.4.2).

5. Verify that the GPIB address switch setting on the emulator controller unit matches the device address assigned to the emulator in the IBCONF.EXE setup program (see Section 2.3.2).

   If you change the GPIB address setting, you must turn the emulator off and on to cycle the power.

   If the error occurs because you have the wrong GPIB_DEVNAME in the V186.CFG file, the IBM PC AT will lock up. You will need to reboot the IBM PC AT, then correct the GPIB_DEVNAME.

   Once you have corrected the problem, re-execute the RUN186.BAT file.

- **Configuration file error**

  An error message is displayed if the emulator software cannot open one or more of the configuration files.

  Recommended Action: Use the EXIT command to exit the emulator software. Re-install the emulator software as described in Chapter 3, then run the RUN186.BAT file.

  If you still have problems, make new back-up copies from the original diskettes, then use them to re-install the software.

- **"...waiting for emulator to respond..."**

  You may see this message if Terminate and Stay Resident (TSR) programs are being used, for example, programs like the DOS PRINT command driver. Or you may see this message if you try to run the emulator software under a multi-tasking shell (such as Windows 386) over the serial link.

  Recommended Action: Either delete the DOS PRINT driver, or lower the serial link baud rate. Or remove the multi-tasking shell program; the emulator software will not run in environments that "steal" CPU cycles.

- **"pwr?>" prompt**

  The "pwr?>" prompt appears when the emulator cannot detect power from the target.

  Recommended Action: If using the crystal power accessory (CPA), make sure you have connected its pigtail cable to the side pins on the probe processor module (see Section 2.5.2). If using a prototype system, turn on power to the prototype.

- **"clk?>" prompt**

  The "clk?>" prompt appears when the emulator cannot detect a prototype clock.

  Recommended Action: Make sure that the prototype clock is working.

- **"reset?>" prompt**

  The "reset?>" prompt appears when the processor /RES line is being held active.

  Recommended Action: Check to see if /RES is being asserted by the prototype hardware. The emulator cannot resume until this condition is cleared.

With the latter three error conditions, you do not need to re-invoke the emulator software. Once you have corrected the power, clock, or reset problem, execute the STATUS (S) command. The command-line prompt should change to "hlt>".

If the actions listed above do not resolve the error conditions, or if you encounter other errors on invocation, contact your nearest Intel service representative for assistance. Service information is printed on the inside-back cover of this document.

4.4 Running the Customer Confidence Tests

The SELFTEST command runs the emulator customer confidence tests. These tests verify the operation of the emulator hardware and detect any catastrophic failures.

You can use the SELFTEST command at any time after the emulator software has been invoked. Be aware, however, that the SELFTEST command resets the emulator hardware and firmware to the power-up state. It erases any user-entered environment settings, such as memory and I/O maps.

SELFTEST requires that the user probe be connected to the crystal power accessory (CPA). If the user probe is connected to a prototype system instead of the CPA, you will receive an error message during Test #8 and SELFTEST will abort (see Table 4-1).

The following example illustrates how SELFTEST works. As each confidence test is run, its name is displayed on the screen along with a "Passed" or "Failed" designation.

SELFTEST aborts automatically if it encounters a test failure. In this case, contact your nearest Intel service representative for assistance. Once the testing is completed, SELFTEST returns the emulator to Halt mode.

You can exit SELFTEST at any time by pressing <Ctrl><Break>.

```
hlt> SELFTEST
Stand by, downloading User Confidence Test software:.......
     ICE-186 Confidence Test:
     Crystal Power Accessory Required
     TEST#          Title                              Status
       1            BASIC FUNCTIONALITY TEST           Passed.
       2            WORD RECOGNIZER RAM TEST           Passed.
                                  .
                                  .
                                  .
      18            EXTENDED TRACE TEST                Passed.
WARNING...emulator has been reset to default activation state
hlt>
```

The installation process is now complete. If this is your first time operating the emulator, you may want to proceed with the emulator tutorial. Invocation and operating procedures for the tutorial are provided in Chapter 2 of the *ICE™-186/188 In-Circuit Emulator User's Guide.*

4.4.1 Confidence Test Descriptions

Table 4-1 lists and describes all of the customer confidence tests that are run during the SELFTEST operation.

Table 4-1 Customer Confidence Tests

Test #	Test Name	Description
1	Basic Functionality Test	Verifies power and clock connections and the ability to halt the emulator.
2	Word Recognizer RAM Test	Performs data and addressing tests on the RAMs in the word recognizer circuitry.
3	State Machine RAM Test	Performs data and addressing tests on the RAMs in the state machine circuitry.
4	Trace RAM Test	Performs data and addressing tests on the RAMs used to trace the application program.
5	Mapping RAM Test	Performs data and addressing tests on the RAMs that map the 128K bytes of ICE RAM to the program memory space.
6	System ICE RAM Test	Performs data and addressing tests on the RAM used in the interface circuitry between the user and the control portion of the emulator.
7	User ICE RAM Test	Performs data and addressing tests on the 128K bytes of RAM available to the application program.

Table 4-1 Customer Confidence Tests (continued)

Test #	Test Name	Description
8	CPA Bus Signals Test	Verifies the address and data paths to the user probe adapter.
9	CPA Interrupts Test	Verifies the NMI, INTR, and /ERROR inputs from the user probe adapter.
10	CPA ASYNCH Inputs Test	Checks all pins on the user probe adapter that were not tested by the CPA Bus Signals Test and CPA Interrupts Test.
11	Read Only Violation Test	Verifies that the read-only violation circuitry recognizes all the address lines.
12	Mapped I/O Test	Verifies that the mapped I/O circuitry recognizes all the address and data lines.
13	Basic State Machine Test	Verifies that the word recognizers and trace circuitry recognize all the data and address lines, and that the state machine cycles through all its states.
14	Basic Word Recognizer Test	Verifies that the word recognizer circuitry responds to ranges and different combinations of bus cycles.
15	Basic Trace Test	Verifies that the emulator can trace different bus cycles and certain events, such as wait states and locked operations.

Table 4-1 Customer Confidence Tests (continued)

Test #	Test Name	Description
16	Events Counter Test	Assures that the event counters for both of the user states work correctly.
17	Extended State Machine Test	Checks such operations as REPEAT, RESTART, FULLBUF recognition, etc.
18	Extended Trace Test	Continuation of the Basic Trace Test to check out all possibilities of trace input conditions.

4.4.2 Confidence Test for the iPAT™ Analyst

When an iPAT unit is connected to the emulator, the iPAT software confidence tests will fail test #24 (target interface board) because there is no target interface board. The test is designed for the I²ICE development system only. Ignore the failure; it has no effect on the operation of the iPAT unit with the emulator.

Appendix A
ESD Procedures

A.1 Introduction

ElectroStatic discharge (ESD) is a sudden electric current flowing from a charged object to another object or to ground. ESD is potentially damaging to the emulator's components. For work areas, Intel recommends using ground straps, smocks, grounding of tables and equipment in the work area, and anti-static mats to reduce ESD.

A.1.1 Grounding Straps

Grounding straps connect personnel and visitors in a work area to ground using a grounding strap from the wrist to a ground wire, bar, plug, or designated ground point. A Ground Strap Checker Box at the entrance of the work area ensures the strap provides proper grounding.

A.2 Smocks

Wear smocks to keep street clothing from contact with the emulator cable and the processor module. Check smocks regularly for excessive wear or tears greater than 1/2". Replace excessively worn smocks.

A.3 Work Surfaces

Ground all work surfaces, storage cabinets, and equipment in the work area to earth. If possible, the work surfaces should be covered with the dissipative material. Ionizers could be installed on equipment where static build-up may be excessive. Check continuity of the grounded work surfaces with an ohm meter.

A.4 Anti-Static Mats

Anti-static mats are not required but are recommended in major aisles and around equipment and tables where floors are not already covered with anti-static carpet. Shoe straps or conductive footwear increase the effectiveness of the anti-static mats. Check anti-static mats regularly with an ohm meter.

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